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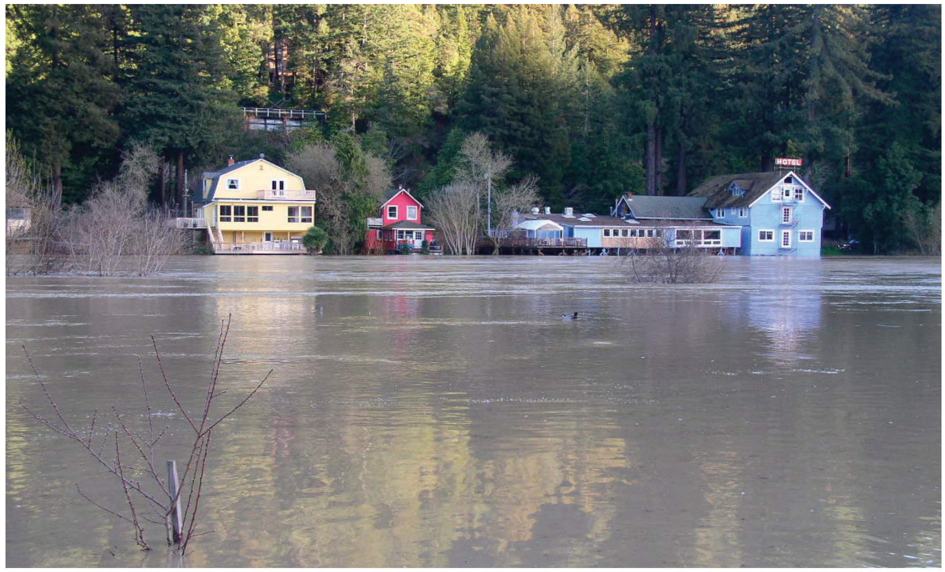


Flooding on the Russian River northwest of San Francisco, Feb 2004. Photo by: David Kingsmill, NOAA

Atmospheric Rivers

Atmospheric Rivers are narrow corridors of concentrated moisture transport in the atmosphere and are a key process linking weather and climate. When atmospheric rivers strike land, they can produce flooding rains that disrupt travel, induce mud slides, and cause catastrophic damage to life and property. The satellite image at bottom-right shows an atmospheric river. The problem is that satellites only detect the atmosphere's moisture content over the ocean and do not provide information on winds; a critical component for precipitation forecasting over land.

What is the Role of Atmospheric Rivers in Creating Floods?

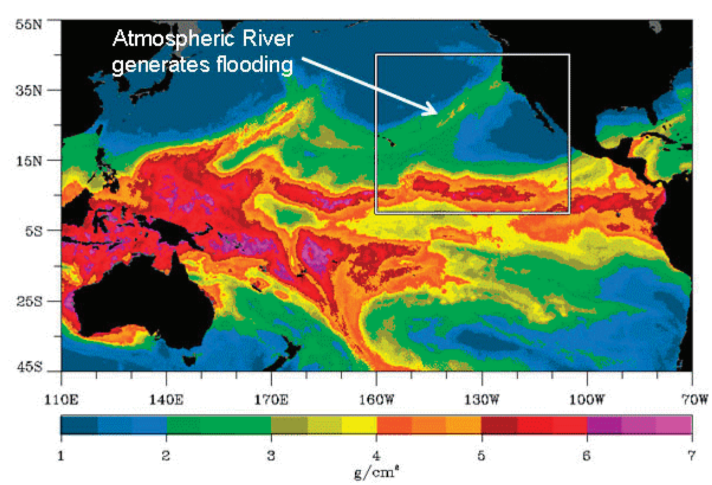
Research has shown there were 42 atmospheric rivers (ARs) that impacted CA during the winters from 1997 to 2006, and the resulting seven floods that occurred on the Russian River watershed northwest of San Francisco during this period were all associated with AR conditions.

The Pacific Northwest also regularly experiences this type of storm. Case in point is the landfalling AR of early November 2006 that produced heavy rainfall and devastating flooding and debris flows with region-wide damage exceeding $50 million.

How is this Being Addressed?

Research experiments performed by NOAA in the 1990's to better understand landfalling Pacific winter storms led to the development of the NOAA Hydrometeorology Testbed (HMT). HMT conducts research on precipitation and weather conditions that can lead to flooding, and fosters transition of scientific advances and new tools into forecasting operations.

Within HMT, scientists have developed and prototyped an atmospheric river observatory (ARO)



Satellite image of the atmospheric river that caused the Feb. 2004 Russian River flooding event (shown in photo above).

designed to further our understanding of the impact of ARs on enhancing precipitation in the coastal mountains and the high Sierra of California.

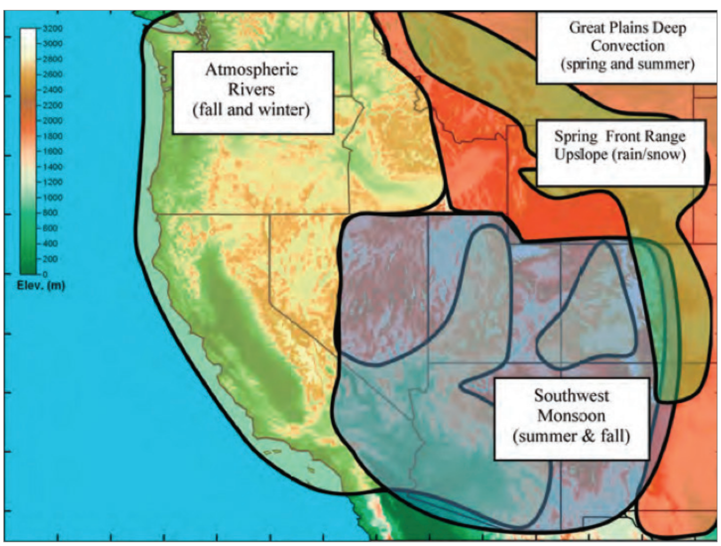
What are the Benefits?

The community of flood control, water supply and reservoir operators of California sees ARs as a key phenomenon to understand, monitor and predict as they work to mitigate the risks of major flood events. Long-term monitoring using satellite measurements, offshore aircraft reconnaissance, and land-based AROs will allow better coupling of climate forecasts with seasonal weather forecasts to improve water management decisions.

For more information, visit:

www.esrl.noaa.gov/psd/atmrivers/

www.esrl.noaa.gov/psd/data/obs/



Regional variations in the primary sources of Western extreme precipitation

NOAA Earth System Research Laboratory
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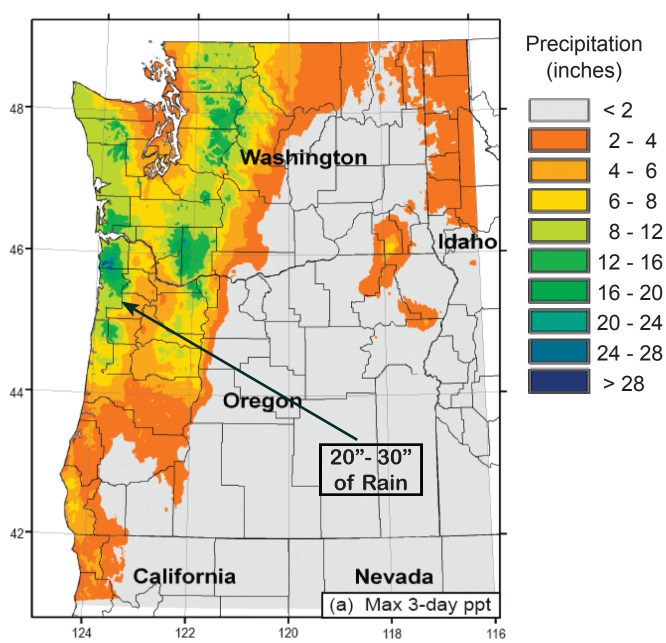
A mobile Atmospheric River Observatory (ARO) deployed in Westport, WA. ARO measurements include winds, water vapor, the altitude at which snow turns to rain, cloud structure, and rainfall.

Aftermath of flooding and debris flow on the White River Bridge in Oregon. Photo courtesy: Doug Jones, Mt. Hood National Forest



Maximum three-day rainfall accumulated during an intense landfalling atmospheric event (Nov. 5-9, 2006).